Title: Integrating Cultural Factors in Military Modeling and Simulation: Anecdotal
Literature Review and Framework for Application
Topic: Coalition Interoperability

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Abstract

Effective and efficient culture cognition in the Future Force depends heavily upon orchestrating the cultural factors and patterns of battle information into effective cultural cognition models so that the appropriate context information is brought together at the appropriate time relative to the appropriate operational issues. At the heart of this problem lies the current inability of a commander (or his designated chief of staff, operations officer, information management officer, etc.) to know in real-time (1) what cultural factors will influence the outcome of a given mission and how these factors will influence this outcome (e.g., Iraq war) and (2) which of the cultural factors (e.g., political structural, religious, socio-economic, etc.) can be used by decision makers to control rhythms of war in their favor. Obviously, there is a need to address two challenges: (1) an understanding of how socio-cultural factors are likely to influence given military strategies and (2) an understanding of how to incorporate these factors into modeling and simulation techniques in order to optimize military personnel training. This paper presents an anecdotal literature review of cultural models and a framework for incorporating cultural issues in military simulations.

1. INTRODUCTION

Recent military operations in Afghanistan and Iraq have illustrated the need for understanding cultural factors in military modeling and simulation. In the new Objective Force structure (http://www.objectiveforce.army.mil), effective collaboration is dependent on the reconciliation and integration of multiple operational perspectives across various organizational boundaries, various bodies of staff expertise, various sources of battle space information, and various battle rhythms. With 4th dimension

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asymmetric warfare increasing, there is an increasing reliance on Joint Task Force or Coalition Task Force philosophies. A typical Coalition Task Force consists of multinational teams with heterogeneous cultures. Even teams with members from the same country may have cultural differences in the way they set up their operating procedures and doctrines in their various organizations (e.g. Air Force, Marines, Army, etc.). The enemy environment defines another type of culture that can be used as a soft weapon against a friendly Coalition Force. The on-going war in Iraq presents a picture of how culture has been used to control the pace of war. Remarkably, the Iraqis have used religion and language to define the rhythms of war, including new methods of deception. The Coalition Forces, led by the USA, are challenged with the daily tasks of learning the Arabic language, understanding the political and economic terrains, adapting to social structures, and so forth. The rising interest in fighting war with coalition forces creates a need for a much greater understanding of cultural knowledge..

Most existing research on culture and society has primarily focused on business settings, and especially on competitiveness (Trompenaars, 1993), business decisions (Schein, 1992), and information sharing (Veiga & Lubatkin, 2000). Results have revealed many causes that affect business and commerce competitiveness in transnational settings (Nisbet, 2003). Among these are: communication and language, value systems, religions and beliefs, security and risks, and fears of being absorbed by another culture. Military establishments have only recently begun to show some interest in understanding the effect of culture on personnel training.

2 THE BASIC SCIENTIFIC CHALLENGE FOR CULTURAL MODELING IN MILITARY ORGANIZATIONS

The main objective of the Joint Task Force (JTF) is the transformation of the United State military force's C2 decision-making capability into a presence with the capability to respond to adaptive adversaries around the world. Recent wars, such as Operation Enduring Freedom and Desert Storm, have demonstrated the relevance of joint interdependency and interagency/multi-national interoperability (Leedom, 2004). Moreover, the need to understand the Iraqi culture and the cultures of the international joint forces cannot be overemphasized. The DoD's Vision 2020 and the Future Force doctrines require well-trained warriors who have a good understanding of the enemy's culture as well as the cultures of the associates within JTF. Therefore, there is a need to understand how socio-cultural factors influence military strategies and to incorporate this understanding into modeling and simulation techniques. To begin this type of modeling exercise, a conceptual framework must be developed that is scientifically sound, robust, and rugged. Such a framework will depend on the existing body of knowledge, both in business and military organizations with dynamic data models and heterogeneous characteristics suitable for plug-and-play descriptive-normative simulation modeling. The initial challenge lies in understanding the military organizational culture.

The impact of cultural factors in JTF can more easily be recognized when the elements of these factors are integrated and made consistent with each other. Socio-cultural factors will continue to play a central role in military decision-making – particularly in high-consequence operations that risk human life. Figure 1 shows the

dimensions for studying cultural effects on military organizations, and especially on the coalition force model.
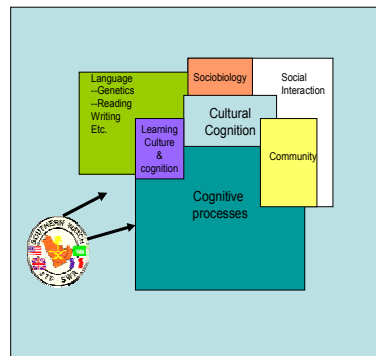

Figure 1. Cultural interaction model.

As shown in Figure 1, the cultural model generates various levels of interaction that form the guidelines for this literature review. The guidelines are:

(a)   Language: This is the main characteristic of human and animal culture (Chomsky, 1972). Language can be acquired, inherited, and learned through written or spoken words.

(b)   Social Interaction: Culture is a by-product of the social interactions of special cohort groups who have intended goals such as military missions, or the preservation of ancestral ethos (Lumsden & Wilson, 1981).

(c)   Cognitive Processes: Culture is also viewed as a product of shared mental models through self- and group- situation awareness (Hutchins, 1991; Orasanu, 1990). Culture can be learned through various processes, including information transmission to a community of people through the use of socibiological models or social network models (Burt, 1980; Colby, 2003).

3. SELECTED DEFINITIONS OF CULTURE:

Many researchers have developed taxonomies to classify the cultures of the world. The following paragraphs summarize selected studies that purport to explain socio-cultural factors based on organizational theories.

Organizational culture is a concept often used to describe shared corporate values that affect and influence members' attitudes and behaviors. In response to the recognition that this culture has limitations in providing the 'glue' that holds organizations together, management over the last two decades has often focused on the concept of corporate culture.   The dominating culture within any organization is usually based upon a blend of visionary ideas and is supported by ongoing analyses of organizational systems, goal-directed behavior, attitudes and performance outcomes (Fry & Killing, 1989). Although a universal definition of corporate culture does not exist, this culture appears to reflect shared behaviors, beliefs, attitudes and values regarding organizational goals, functions

and procedures that characterize particular organizations (Furnham & Gunter, 1993). The main difference in the definitions of corporate culture appears to reside in their focus on either the way people think, or on the way people behave (Williams, Dobson & Walters, 1989), although some definitions focus on both the way people think and the way they behave (e.g. Margulies & Raia, 1978; Uttal, 1983).

Hofstede (1980, 1991) identified a four–dimensional model of culture that is useful for examining the effects of a heterogeneous culture on team decision-making (Handley and Levis, 1992). The first dimension in this model is Power Distance (PD). This dimension reflects the nature of leadership (i.e. consultative versus autocratic) and the acceptance of team members of unequal power relationships.   It is defined by statements such as those indicating that juniors should not question the decisions or actions of their superiors.). The second dimension is Individualism-Collectivism, which defines differences among individualistic cultures in which people define situations in terms of costs and benefits for themselves, and more collective cultures in which the focus is on the harmony within one's primary work or family group. For example, the concepts of teamwork and communication may be more easily achieved by collectivist cultural structures than by cultural structures with a more individualistic orientation. The third dimension, termed Uncertainty Avoidance (UA) is focused on the belief that organizational rules should not be broken. Different cultures respond differently to the unknown and employ different behaviors toward ambiguity. According to Hofstede's analysis, high UA cultures tend to be formally structured with clear distinctions among social roles. Organizations, institutions and relationships are highly structured so that people can easily interpret situations and understand their role and the expectations of them. In addition, high UA cultures encourage conformation and discourage "difference." By contrast, low UA cultures tend to allow more flexibility in social and personal relationships, encourage tolerance towards those who are "different" and show less fear of ambiguous situations. These patterns may have consequences on how teams make decisions. The fourth dimension is masculinity and femininity. This dimension focuses on the extent to which a society stresses achievement or nurturing. Masculinity is the trait that emphasizes ambition, acquisition of wealth, and differentiated gender roles. Femininity is the trait that stresses caring and nurturing behaviors, sexuality equality, environmental awareness, and more fluid gender roles.

Anthropologists Kluckhohn and Strodtbeck (1961) developed a framework of six dimensions to describe the value orientation of a culture. The value orientation represents how different societies cope with various issues or problems. In the Kluckhohn and Strodtbeck framework, a culture may favor one or more of the variations or approaches associated with a particular value orientation. These orientations are: relation to nature, time orientation, basic human nature, activity orientation, relationships among people, and space orientation. Trompenaars (1993), a Dutch economist, also developed a framework to examine cultural differences. Trompenaars described national cultural differences using seven dimensions. Five dimensions address the manner in which people relate to others, including universalism versus particularism, individualism versus collectivism, neutral versus affective, specific versus diffuse, and achievement versus ascription. The sixth dimension is time orientation: past, present, or future and sequential or synchronous. The final dimension is the relationship to nature: internal- or external-

oriented. Just as with the Kluckhohn and Strodtbeck work, Trompenaars' dimensions represent how societies develops approaches to handling problems and difficult situations.

A different approach to understanding culture is the use of metaphors. The cultural dimensions described by Gannon and his associates (1994) can be derived from the symbolic metaphors of a society's everyday language. While explaining each metaphor, typical behaviors in the culture are likely to emerge. Schein (1992) noted that culture exists on three levels. On the surface are artifacts (the observable symbols, behaviors and practices). Underneath these artifacts lie values and cultural norms and at the deepest level core beliefs and assumptions reside. These basic beliefs and assumptions, which nurture and support the norms and values that members hold, are outside ordinary awareness and are ofteninaccessible to consciousness. The most accessible and visible elements of a culture- the artifacts, behaviors and practices- are viewed as furthest from the core of the culture. Viewed at a surface level, these artifacts can be seen simply as phenomena. When members of a group have a history of shared experience, and develop shared values and understandings that guide behaviors and practices, these phenomena have cultural significance. Schein (1992) believed that cultural study required exploration of the shared beliefs, values, and knowledge that guide and direct observable practices, behaviors, and other visible cultural manifestations.

The literature review highlights at least four important knowledge base requirements for coalition cultural modeling. These requirements are:

1. <u>Culture is an integrated system of the ideas, learned behavior patterns, and product characteristics of a society</u> (Hierbert, 1983). This view supports the fact that organizational memory can be developed with culture as its center of gravity (Nonaka & Takeuchi, 1995)

2. <u>Culture is a set of assumptions</u>, beliefs, values, and norms that are shared by members of an organization. Each dimension can metaphorically represent the spatial location of individuals and group thinking in a trajectory of social norms (Nisbett, 2003). This view represents the normal process of modeling complex systems—assumes certain relationships, reduces non-linear systems to programmable linearity, divide and conquers, and subsequently synthesizes all of these elements. (Koomen, 1985).

3. <u>Culture is any information transmitted among individuals and among generations by non-genetic means (</u>Spector and Luke, 1996; Bonner, 1980). This is the computational view that assumes that culture can be represented as a system of symbols (Boyd & Richerson, 1985).

4. <u>Culture is a cognitive process since it is the process of dealing with information about the past, the present, and the future</u> (Brown, Collins & Duguid, 1989). People everywhere must process information and this phenomenon represents a universal need for cognition and culture. Cultural cognition is the imperative for team situation awareness (Endsley, Bolte, & Jones, 2003), and team mental models (Hutchins, 1991).

4. IMPORTANT CULTURAL FACTORS IN ORGANIZATIONAL MODELING

To further understand the implications of Figure 1, it is necessary to review the importance of cultural factors in at least three complementary dimensions.

4.1 Cultural Cognition Model.

Culture is not limited to countries or nations. Even two people who share a life together can create their own culture. They can have customs, traditions, stories, and beliefs that bind them and give meaning to their life together. Cultural cognition model capture these attributes and deal with the locus of knowledge that is held individually and based on the society's dictated modus operandi and the methods used by individuals to share their mental models with other members of the society. Samples of these methods include analysis of language, quasi-analytical models of beliefs, and conflict resolutions (Bibby, 1992; Brown, Collins, & Duguid, 1989;Tomassello, Kruger, & Ratner, 1993).

Cultural cognition is the study of what people can say about what they know (Hutchins, 1991). An example used in capturing team knowledge is story telling. Storytelling has become a commonly recognized method for communicating visions, strategies, structures, identities, goals, and values within both organizations and cultures (Denning, 2001; Swap, Leonard, Shields & Abrams, 2001). Stories also represent a powerful mechanism for communicating themes and evoking visual images (Morgan & Dennehy, 1997).

In attempting to affect C2 in a coalition setting, decision makers must cope appropriately with various types of organizational ignorance that may occur as a result of interpreting different cultural characteristics. Examples of this ignorance may include:
- A lack of sufficient information to make decisions due to situation uncertainties.
- Bias that tends to sway decisions in one direction.
- Multiple, competing frameworks to interpret the relevance of cultural information (explanatory equivocality).
- Limited insights on the effect of cultural implications.
- Cultural models that govern the ways people interpret their experiences and guide actions in a wide range of life domains. An especially important type of cultural model is a script (Schank & Abelson, 1977). A script is an event schema that stipulates the people who appropriately take part in an event, the social roles they play, the objectives they use, and the sequence of actions they engage in. (Nisbett & Norenzayan, 2002, p.6).
- The schema notion helps to organize and explain the radical differences inthe contents of human minds across cultures.

4.2 Organizational Knowledge-based Model.

Organizational culture is the set of assumptions, beliefs, values and norms that are shared by organizational members. Each dimension can metaphorically represent the spatial locations of individual and group thinking in the trajectory of social norms (Nisbett, 2003). This culture may have been consciously created by its key members, or it

may have simply evolved across time. The culture represents a key element of the work environment in which employees perform their jobs.

The issues of organizational knowledge acquisition and storage as organizational memory have been widely recognized in the business domain. Nonaka and Takeuchi (1995) have suggested that knowledge is created through four different modes: (1) socialization, which involves conversion from tacit knowledge to actionable knowledge, (2) externalization, which involves conversion from tacit knowledge to explicit knowledge, (3) combination, which involves conversion from explicit knowledge? You are converting a to a. to explicit knowledge, and (4) internalization, which involves conversion from explicit knowledge to tacit knowledge. In developing a framework for a socio-culturally-based simulation environment, the dimensions of organizational knowledge are relevant:

- Organizational culture is a strong force—one that may hinder the implementation of knowledge management in an organization (Ladd & Heminger, 2002).
- Specifically, organizational culture may affect an organization's ability to transfer knowledge because a culture may encourage individuals either to resist searching out and receiving knowledge or to resist efforts to move knowledge out of their heads.
- An organization whose members' interests have diverging interests can expect less knowledge to be transferred than one whose members have converging interests. A diverging of interests appears to increase the likelihood of self-serving behavior at the expense of overall organizational performance—because individuals either do not understand how organizational performance benefits them personally, or do not care.
- From an organizational perspective, the collective values and beliefs of the individual members of an organization represent an organizational culture. These values and beliefs constitute a pattern of basic assumptions held by the people in the organization that is used to address the problems of adaptation and integration.

4.3 Knowledge Mapping.

Both cultural cognition and models of organizational memory have been found to be crucial in modeling socially motivated collaborative systems (Barney, 1985; Burt, 1980; Monge & Contractor, 2003). Moreover, these elements depend on the structure of the social group culture (SGC). Implementation of the SGC information by a computer may require more sophisticated complex computer coding such as that presented in Dawkin's meme (Dawkin, 1982). Complexity may arise as a result of information integrated by functions, operations, and the activities the subsystem is supposed to perform. A good deal of implicit knowledge is needed to validate simulation models, especially when there are transitions from a system of subjective symbols to quantitative representations. This type of mapping is responsible for hesitations in the application of genetic algorithms or neural network models to cultural algorithms (Cavalli-Sforza & Feldman, 1981).

Knowledge in an organization can be either captured explicitly or tacitly. Captured knowledge is placed in a form that makes it useful to others in the organization. Explicit knowledge consists of those things that individuals know that they know. Both captured and explicit knowledge are easier to deal with and are often tackled first in a knowledge project through solutions such as document management systems or skills' databases. Tacit knowledge is the most difficult to tap into and utilize. While often neglected in knowledge management systems, tacit knowledge is probably the most important type of knowledge at an organization's disposal (Cavalla-Sforza & Feldman, 1981). Capturing tacit knowledge is another challenge in developing a cultural-based simulation model.

5. CULTURE IN THE MILITARY ORGANIZATIONS: IMPLICATIONS AND A FRAMEWORK FOR SIMULATION APPLICATION

5.1 Caveat

Organizational culture is a concept often used to describe shared values that affect and influence members' attitudes and behaviors in a particular society. For several centuries, humanity has been obsessed with its cultures. The dominating culture within any organization or society is usually based upon a blend of visionary ideas and is supported by ongoing analyses of its goal-directed behaviors, attitudes, and performance outcomes (Perrow, 1986; Geertz, 1973). In general, culture brings specific ingredients that bind a people together: shared behaviors, beliefs, attitudes and values related to goals, functions and procedures established by a specific organization. The main differences in the definitions of culture reside in the way people think, and/or the way people behave (Bourdieu & Passeron, 1990).

Culture is heterogeneous when it involves people of various backgrounds interacting. It is homogeneous when people share common beliefs, attitudes, and values. Although the belief and values of an organization can be common, its function or purpose can vary from division to division, department to department, workgroup to workgroup, and individual to individual. Different sub-cultures, therefore, emerge from, or form around, functional groups, hierarchical levels and corporate roles with very few values, beliefs, attitudes or behaviors commonly shared by the whole corporate membership. On the basis of these phenomena, mathematical models have been used to represent the organizational behaviors (Sandoe, 1998). These models are a corpus of frameworks that are amenable to symbolic programming by a computer.

Organizations can also develop specific cultures that affect their performance. For instance, in the context of JTF, diverse cultures must be shared and used to support the decision-making process. Strategically, the enemy's cultural traits remain important ingredients for understanding the evolving behavior in asymmetric warfare environments. For example, in effect-based operations (EBOs), the focus is on prolonged, low conflict actions, with direct attack on will, either during peace, crisis, or war-time (Smith, 2002). Thus, EBOs are not simply a mode of warfare. They encompass the full range of actions that a nation may undertake to induce a particular reaction on the part of the opponent, ally, or neutral entity (Smith, 2002, pp. 47).

While military organizations are increasingly recognizing the importance of socio-cultural factors in military planning and intelligence sensemaking processes

(Handley & Levis, 2001), a challenge lies in adopting active approaches to defining cultural identity, preserving it in the organizational knowledge base, and using it to drive simulation and training. This notion makes the current approaches to military organizational modeling and simulation less useful for the training of modern military personnel. There is a need for innovative approaches to creating a resilient, robust, and dynamic framework for simulation that complements or extends beyond the existing high level architecture (HLA) considered standard for the military. However, despite its relevance, organizational culture remains rather ill defined and rarely used in constructive-based simulation models.

5.2 A Framework for Cultural Factors in Organizational Model

The characteristics of organizational culture are important to the organizational performance. These characteristics are, in part, based on a taxonomy of cultural concepts including, but not limited to, (Brooks, 1994): artifacts- such as espoused values; symbols (e.g., language), food and religion; organizational structure; leadership styles; power dimensions; environment and technology; attitudes towards time, environment, uncertainty, and strangers; beliefs-(e.g., gender roles in the society); socio-economic factors, and political factors- (e.g., government and ideology). Other factors include war, migration, ecological crisis, economic crisis, and terrorism. A researcher can use this taxonomy to study two opposing factors. For example, the reductionistic versus holistic models; and, particularism versus universalism models. In the reductionist view, a divide and conquer approach is often the rule of thumb (Schein, 1992), whereas, in the holistic approach considers complex interrelations .in the organizations. In the particularism model, behaviors of individuals in the organizations are observed and analyzed. Here, the goal is to improve the individual performance. For example, the individual soldier training is often conducted to gain insight on motivation, fatigue, and so forth. On the universalistic view, soldiers are trained as teams to work collaboratively towards a single mission or goal.

Many people often wonder why others see things differently than they do or appear to be impervious to what is obvious. The reason is simple: their knowledge repertoire and mental models prevent them from seeing the reality of the situation. Team knowledge of and about a task is composed of what each team member understands about his or her cultural setting. Rentsch, Hefner, & Duffy (1994) note that teamwork knowledge is an example of a cultural schema or team mental model. Organizational culture has many attributes as previously stated. Therefore, a framework that models cultural factors must be sensitive to various assumptions and multi-logic dimensions.

Within the cultural framework hypothesis, the coalition social categories can be interpreted in the context of the coalition member's force power. For example, The United States of America is widely seen as possessing the force power and technology required to fight modern warfare. Poor nations who joined the coalition during the first Gulf war in Kuwait complained that poor training was responsible for degraded performance because they could not comprehend sophisticated technology-driven US weapons. They expected face-to-face, tank-to-tank combat. To their surprise, it was air power that comprised seventy five percent of the war. Training of coalition members must be stratified based on social and economic categories. In fact, there may be

misconceptions by coalition members with less technologically developed weapons that allow them to view more technologically sophisticated members as possessing intentions to impose their technology culture on them. This situation requires training "with explanations".

5.3 Signs, Signals, and Symbols: The impacts on the cultural perception of information

Coalition operations are governed by multiple national rules of engagement. This creates C2 complexity. This challenge is tantamount to a unified commander trying to control a very large number of "actors' in battle. Chaos remains relevant and spans across all phases of decision making: strategic, operational, and tactical. The factors representing the C2 elements can manifest themselves in the form of signs, symbols, or signals used in military communications. This situation poses a problem with standardization in the military modeling and simulation domain, where, for example, different symbols may mean different things to different coalition members. Thus, a coalition member's attention is turned to differences among the entities at the same level of analyses (e.g. the symbols or signals). Symbols at the same level may indicate that the locus of culture is situated and they may influence the C2 process at, in the least, two complimentary levels of knowledge:

(i)   Team situation awareness. All elements in the organizational structure have the same operational model of the battle space.
(ii)   Cultural cognition. Members of the organization, with diverse and heterogonous cultures, must develop a common cultural cognition to embrace some aspect of an individual culture. This situation occurs most commonly with the increasing use of coalition forces from different friendly nations.

5.4 War Gaming and Simulation Applications

War games are the center of gravity of military training. However, very few of the war games use cultural factors. Future Forces war games and simulation models must consider the cultural dynamism defined by various effect-based factors that may capture the parameters of the individual coalition factors or cultural actors. Some of the relevance factors are:

1. The Psychological Process: Culture is shaped by both psychological processes that determine how people think and feel, and social processes that determine how people interact ((Henrich & Boyd, 2002). This knowledge is fundamental in designing human-computer interaction for simulation models.

2. Cultural Differences and Risk Perception: Cultural differences affect our judgment and risk perception in a context task (Hsee & Weber, 1999). Hsee & Weber (1999) concluded that more Chinese than Americans take financial risks, and hence, are more culturally risk –seeking; on the other hand, more American were found to be more risk-seeking in social variables. These findings suggest that simulation models need to include risk

perception as a component of the performance factors, especially, when coalition warfare planning is at stake. For example, most people exhibit nativist thinking (i.e., they think in terms of their specific culture). At the other spectrum are people who think empirically through learning and inference.

3. <u>Dynamics of Cultural Representations</u>. Simulation models must establish culturally available schemata (CAS) where everyday cognition applied to decision making relies on a situational context (Abelson & Schank, 1987). With schema, knowledge structures that represent objects and events can be represented, and it is possible to provide default assumptions about their characteristics, relationships, and entailments under conditions of incomplete information – (D'Andrade, 1995). The military legacy systems, standard operating manuals (SOP), training manuals, and doctrinal handbooks have invariants of embedded cultural factors that in one way or another tends to capture organizational beliefs, ideas, mental models, shared behaviors, attitudes, and values.

4. <u>Analogies and Metaphors in System Modeling</u>: In reality, modeling and simulation are analogies of real systems that are represented metaphorically by derivative languages and symbols amenable to computation. Hofstadter (in Godd, Escher, Batch: An Eternal Golden Braid) notes that ants share a single, largely genetically structured set of goals and a single plan. In the same analogy, culture can be seen as an organizational goal, or, as constraints that control the performance of the organization. Culture can be a single, largely unstructured commander's intent that is governed by battle space informational footprints. In this regard, Vygotsky (1978) notes that human cognition and decision-making develops in the species-specific medium of culture, which is an accumulated pattern of tool-use throughout the historical existence of a group.

6. CONCLUSIONS and OBSERVATIONS

This paper has focused on an anecdotal review of cultural factors and their implications for military modeling and simulation. Changes in the modern warfare that includes its asymmetric nature and coalition forces were addressed. The following are observations and conclusions based on the existing literature in the topical areas:

6.1 General
- Culture influences cognitive fundamentals for teamwork, such as communication, coordination, and decision-making (Bowman & Pierce, 2004).
- US Forces are not fully prepared to meet the unique requirements of peacekeeping mission and lack of skill in multinational teamwork is a specific barrier to effective performance (Klein & Pierce, 2001; Pierce & Pomranky, 2001).
- Cultural traits are responsible for the conflicts among the styles of performance of EBOs and C2 in modern warfare systems.
- Language and communication are the major drawbacks in plan integration and inmost logistical problems. Understanding a common operating picture of JTF demands near realism and congruency in signs, signals, and symbols. These factors are important in the development of common interface architecture for simulation and war game software systems.

- Organizational barriers to teamwork are the result of national military strategies and processes.
- Lack of cultural awareness: Understanding the culture of team members and the country of service are crucial for decision-making.
- Overall, conflicts within groups are unrelated to demographic variables such as age, ethnicity and gender, but these differences are related to the values among group members (McGurk, Thomas, & Bliese, 2004).

6.2 Influence on military C2

Coalition Cultural Factors:
    Individual Differences:
- Information processing and cognitive ability—pace, accuracy, and so forth
- Personality styles: introvert, extrovert—concrete vs. conceptual thinkers
- Behavior such as response to anomalies, chaos, uncertainties, and so forth
- Perception of situation: interpretation & understanding

Coalition Organization differences:
- Chain of command
- Command & control: command intent, authority, command styles
- Organizational policies
- Concept of mission
- Variants in strategy, operation, and tactics
- When values are shared, there is a built-in tendency to work with the same operating system.
- Organizational theorists tend to believe that, regardless of the type of design structure, cultures emerge from organizational designs (Colby, 2003). Hofstede's (1980, 1991), Kluckhohn and Strodtbeck (1961), and Schein (1992) have independently identified power dimensions as the main sources of unhealthy organizational management. A team interaction mental model and situation awareness (SA) have also been investigated, and results show that both provide information concerning the roles, responsibilities, communication patterns, and interactions among team members (Converse, Cannon-Bowers, and Salas, 1991; Endsley and Pearce, 2001).

6.3. Simulation and Modeling Applications.

- Mathematical models of culture are too minimal to cope with the open-ended diversity of culturally derived information (variation is generally restricted to trial and error learning or transmission error).
- There are numerous intra-individual factors that undoubtedly have emergent inter-individual consequences, such as how representations are grounded in experience and how they are stored, retrieved, and implemented. Models of individual intelligence and creativity, on the other hand, lack transmission and replication.

- Culture is heterogeneous when people of various backgrounds interact with one another. It is homogeneous when people share common beliefs, attitudes, and values. Although belief and values can be common in an organization, its function or purpose can vary from division to division, department to department, workgroup to workgroup, and individual to individual. Different sub-cultures, therefore, emerge from, or form around, functional groups, hierarchical levels and corporate roles, with very few values, beliefs, attitudes or behaviors commonly shared by the whole corporate membership. On the basis of this evidence, mathematical models have been used to represent behaviors in these organizations (Sandoe, 1998). The complexity of layered representation based on military hierarchy design and command level interaction remains a fertile area of research.

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